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A BOTANICAL TRIP TO MEXICO. II

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THE COMMON WILD GRASSES OF MEXICO

THE general botany of the country is not here elaborated, but the ecologist will readily coordinate the flora upon the basis of the grasses.

Eastern Coastal Plain.—The grasses of this region are illustrated by the specimens collected at Tampico and Veracruz. At the former locality the grass flora is poor in species and individuals. Only about twenty species were found, and many of them represented by single or scattering specimens. Along the brackish mudflats were found certain common marsh grasses, such as *Monanthochloe littoralis*, a creeping wiry grass with clusters of awl-shaped leaves about a quarter of an inch long; *Sporobolus virginicus*, with stout creeping rootstocks that send up short stems bearing conspicuously two-ranked leaves and a close cylindric flower head; *Paspalum vaginatum*, with numerous leafy stolons, the upright flower stems bearing a pair of slender flower spikes; and *Spartina spartinae*, a conspicuous marsh grass, growing in large tussocks, the leaves long, slender and sharp-pointed, the narrow flower cluster raised above the numerous leaves. On the sand dunes and sand flats along the beach one finds, besides the ubiquitous sand-bur (*Cenchrus carolinianus*) and crab-grass (*Syntherisma sanguinalis*), a species of *Eragrostis* (*E. secundiflora*) with erect stem about a foot high and a close, somewhat interrupted inflorescence. This grass is common in sandy soil as far north as Kansas. In pools among the dunes is found *Panicum geminatum*, a perennial water grass with smooth stems, creeping rootstocks and a narrow flower head several inches long.

At Veracruz there is a series of sand dunes separated from the sea by a wide sandy flat. Upon this flat are found several species of grasses in great abundance. Among these may be mentioned *Trachypogon Gouini*, an upright plant about two feet high with a conspicuous feathery flower head; *Sporobolus indicus*, a bunch-grass with long filiform leaves and very small flowers in a long narrow panicle; *Eragrostis Elliottii*, in



TROPICAL JUNGLE NEAR JALAPA.

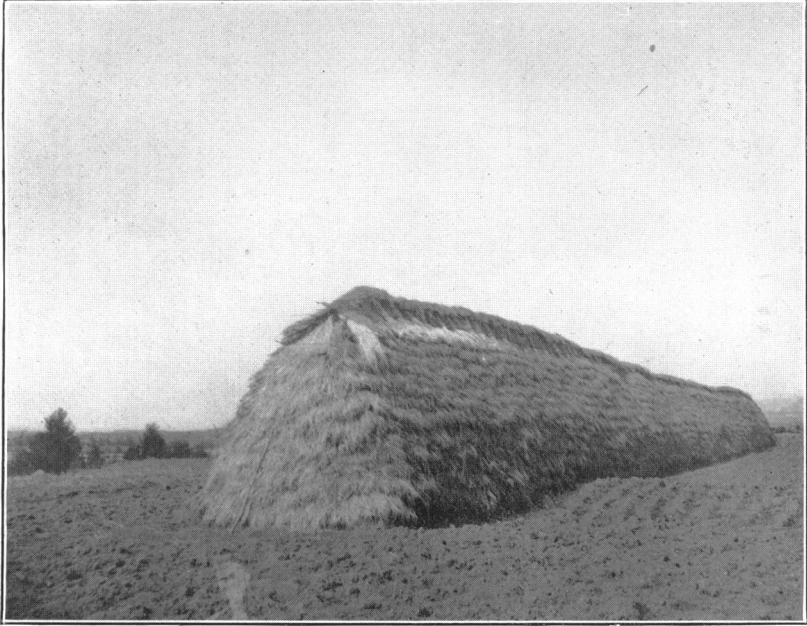
spreading clumps with a diffuse stiff panicle of long spikelets, a species of the southeastern United States; *Bouteloua filiformis*, a common species on the plateau. At the foot of the sand dunes there was an abundance of *Panicum Gouini*, a creeping plant with short upright stems, bearing an oval cluster of flowers. Among the other interesting grasses found at Veracruz may be mentioned *Eragrostis prolifera*, an unusually large species of the genus, with stout erect stems as much as seven feet high and a long loose panicle a foot or more in length. This species was evidently relished by stock, as it was found only when protected by the clumps of bull's-horn acacia or other thorny shrubs. Along the wagon road through the moist lowland there is a rank growth of Pará-grass. This grass is abundant in moist open protected places in the lowlands of tropical America, but does not appear to be a native of Mexico. It is introduced probably from Brazil. Veracruz is an interesting locality to the botanist because it was here that a French physician, Dr. Gouin, made a valuable collection of plants during the French occupation of Mexico. Several species are named for Dr. Gouin and the specimens collected by him at Veracruz are the types. Among these are the two species mentioned above, *Trachypogon Gouini* and *Panicum Gouini*.

Western Coastal Plain.—Collections were made at Manzanillo and Guaymas but the plants of the latter place are es-



A MODERN RAILWAY CROSSING THE ANCIENT HIGHWAY FROM VERACRUZ TO MEXICO CITY. This road is said to have been built by Cortez.

entially the same as those of the Sonoran plateau and will be discussed under that head. The country around Manzanillo is hilly and the grass flora is meager, as the hills are covered with forest. On the cliffs and shore facing the ocean were found several kinds of grasses among which may be mentioned three. The rare *Bouteloua repens* was first described in 1816, under the name *Dinebra repens*, from the collections of Humboldt and Bonpland in the latter part of the eighteenth century on the seashore at Acapulco, Mexico. The species had remained unknown since that time, botanists having concluded that the original collection was probably a peculiar form of the common allied species *B. filiformis* (*B. bromoides* of many authors). The specimens collected by myself at Manzanillo, in the sand near the ocean, in the same habitat as those collected by Humboldt and Bonpland at Acapulco only a short distance to the south, correspond perfectly to the original description and plate of *Dinebra repens* upon which *Bouteloua repens* was founded. The second species is *Panicum molle* Swartz, found along the face of the cliff near the sea. This name has been misapplied to the Pará-grass (*Panicum barbinode*), but an examination of the original specimen in the Swartz Herbarium at Stockholm shows that it is the same as the plant



A STACK OF WHEAT NEAR POPO PARK.

here mentioned. This species, found from Mexico to Colombia and Jamaica, is a bushy little annual with small panicles of velvety spikelets. The third species is *Tripsacum lanceolatum*, a tall perennial with broad leaves and terminal clusters of two or three spikes of flowers, the lower parts of which are pistillate and break up into one-seeded joints, and the upper parts staminate, falling away entire. Single spikes arise also from the axils of the leaves. This species is more characteristic of the barrancas and rocky slopes of middle altitudes.

Except the grasses growing on the sandy flats around Veracruz, which should produce fair forage when young, the species mentioned for the coastal plain are of no particular agricultural importance.

The Plateau.—As stated previously the plateau region includes a large portion of the total area of Mexico and the grasses are correspondingly numerous and diverse. As the rainfall increases southward the grass flora becomes more abundant in that direction.

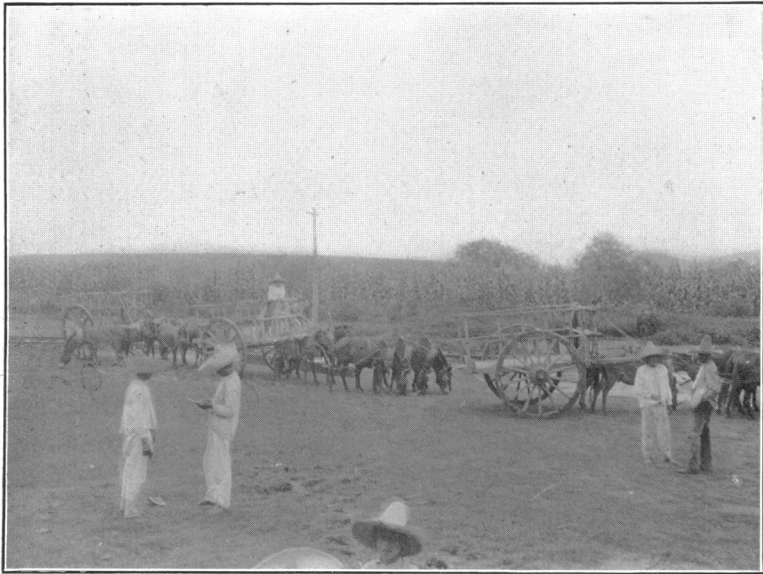
The Sonoran area is well illustrated by the collections made in 1908 at Hermosillo, Llano and Guaymas in the state of Sonora. The grasses are so numerous that only a few of the more conspicuous sorts will be mentioned here. The genus



A NATIVE LAUNDRY. Clothes are commonly laundered in streams, being beaten upon stones and then spread to dry upon the grass or shrubs. In the cities there are often public laundries in substantially roofed open buildings provided with running water.

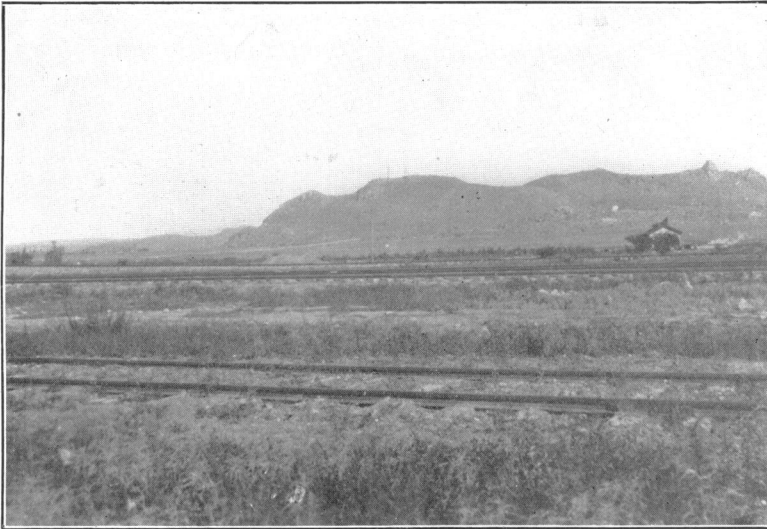
Bouteloua, or the grama grasses, is represented by several species: *B. curtipendula* (side-oat grama), a bunch grass with erect culms one to three feet high, the inflorescence consisting of several short spikes on one side of a slender axis; *B. Rothrockii*, a smaller grass with a few longer spikes, also usually turned to one side of the stem; and *B. aristidoides*, an annual, six to twelve inches high, with numerous small and delicate spikes. *Panicum hirticaule* is an annual species with hirsute sheaths and diffuse panicles of small spikelets. *Heteropogon contortus*, found especially on rocky hills, is distinguished by the single scaly spike with several sharp-pointed brown fruits, each with a long more or less bent and twisted awn or tail. *Andropogon saccharoides* is a tall perennial, with hairy nodes or joints, and an oblong inflorescence, white and feathery because of the numerous white hairs among the flowers. *Chloris virgata* is a common annual weed, with several digitate spikes of fuzzy flowers.

The great central plateau, extending from the United States to the state of Oaxaca, is preeminently a grass region. The mesas, valleys and the lower mountain slopes support a large number of species of grasses that are able to thrive under arid or semiarid conditions. The abundance of the growth depends



A TYPICAL SCENE IN RURAL MEXICO. The pointed straw hats with wide brims are universally worn by the peons. The hats with upturned brims often serve in lieu of pockets as receptacles for small parcels.

upon the amount and distribution of the rainfall. As stated in a previous paragraph the annual rainfall increases toward the south. The arid portion of the plateau extends south to approximately the twenty-second parallel, thus including the state of San Luis Potosí. The grasses of this region were studied at Miñaca and Chihuahua in the state of Chihuahua, Torreón and Saltillo in the state of Coahuila, Monterey in the state of Nuevo León, Durango, Zacatecas, Aguascalientes and San Luis Potosí. Attention will be drawn to only a few of the more common species found in this area. Two species of grama grass are common and are important forage grasses, *Bouteloua hirsuta* and *B. gracilis*, both perennial bunch grasses, the inflorescence consisting of two or three spikes at the top of the stems. One spike stands at the end and the other one or two a short distance below, all turning to one side and moved about by the wind like little vanes. Several species of *Aristida* are common, but of little value from a grazing standpoint. The fruit is sharp-pointed and bears three slender awns, whence the names triple-awned grass and spear-grass. The sharp fruits are troublesome to stock, often working into the flesh and causing irritation. The genus *Stipa* is well represented. The fruit is sharp-pointed but bears a single long awn. The buffalo grass (*Bulbilis dactyloides*) and curly mesquite (*Hilaria*



THE FAMOUS IRON MOUNTAIN AT DURANGO, made up mostly of iron ore.

cenchroides) are small sod-forming grasses, propagating by runners. The flowering stems rise to the height of only a few inches. *Sporobolus*, *Muhlenbergia* and *Epicampes* are well represented. Two species of the first genus, *S. Wrightii* and *S. airoides*, called sacaton, form large tough tussocks, the flowering stems bearing a diffuse panicle of small flowers. The first-mentioned species is taller, reaching the height of five to six feet. There are many small species of *Sporobolus* and *Muhlenbergia* that form a considerable portion of the grass flora, the latter genus differing in having awned florets. The species of *Epicampes* are tall coarse grasses with narrow, usually pale inflorescence. Three small grasses belonging to three genera, but resembling one another in general appearance, are common upon dry hills. They are *Muhlenbergia Wrightii*, *Pappophorum Wrightii* and *Lycurus phleoides*, all agreeing in having a spike-like inflorescence, but differing in the structure of the spikelets.

Over the southern half of the plateau the aspect of the grass flora is similar to that of the northern portion, but the species differ slightly. There are other species of *Bouteloua* and of the allied genera *Pentarrhaphis* and *Cathestecum*.

Collections were made at Zapotlán and Guadalajara in Jalisco, Irapuato and Acámbaro in Guanajuato, Querétaro, Pachuca in Hidalgo, Toluca and Popo Park in the state of Mexico, various places in the Federal District, Uruápan in Micho-



A CLUMP OF *Tripsacum lanceolatum* GROWING ON IRON MOUNTAIN, NEAR DURANGO.

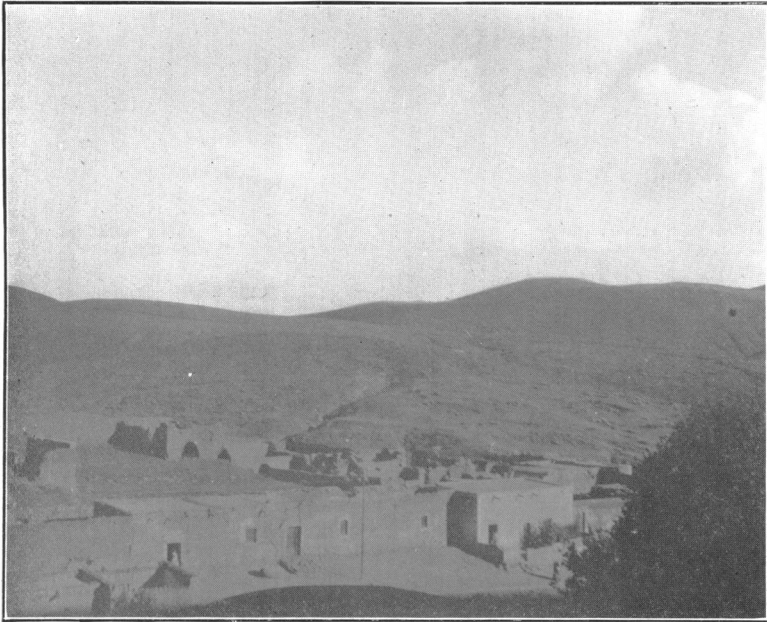
acán, Cuernavaca in Morelos, Chalchicomula, San Marcos, Esperanza and Tehuacán in Puebla, and Oaxaca in the state of the same name. Upon the mesa in the state of Puebla certain species of *Stipa* are conspicuous because of the long narrow nearly white inflorescence. They are bunch grasses with narrow leaves (*Stipa Ichu*, *S. multinodis*, *S. tenuissima*). Over a considerable proportion of the table land the cactuses and yuccas are a conspicuous and often dominant element of the flora.

Slope from Plateau to Coastal Plain.—Except in the northern part of Mexico the slope from the table-land to the coastal plain is rather abrupt, and in some places, such as in the eastern part of the state of Puebla, extremely abrupt. This slope is marked by a series of foothills and deep ravines. These ravines, fixing the position of the water courses and often 2,000 or more feet deep with precipitous sides, are known by the Spanish word barrancas. This slope with its attendant magnificent scenery may be seen from the railroad in going from San Luis Potosí to Tampico, from Mexico City to Veracruz by way of Orizaba, and from Guadalajara to Manzanillo. In passing from Puebla to Oaxaca the railroad descends to less than 2,000 feet at Tomellin and then ascends through the beautiful Tomellin Canyon to the table-land. About six miles east of Guadalajara and easy of access is another remarkable can-



A SCENE ON THE MEZA OR PLATEAU IN NORTHERN MEXICO. An adobe house at the left. Adobe is made by mixing the clay soil with water and adding straw for binding. The plastic material is shaped into large bricks and dried in the sun. Adobe is much used in the northern states of Mexico where the rainfall is light. It is also used in southern Arizona and New Mexico.

yon, the Barranca de Oblatos, through which passes the Santiago River, the outlet of Lake Chapala. These slopes and barrancas are usually covered with grasses and other herbaceous vegetation. Forest is by no means absent, and the proportion increases toward the lower altitudes, but the tops of the hills and the steeper sides of the barrancas are usually too dry to support woody vegetation, and here the grasses abound. The number of species of grasses is greater in this region than in any of the other floral areas. The following are a few of the more conspicuous grasses observed along the rims and sides of the Barranca de Oblatos: *Heteropogon contortus*, a perennial with spikes of imbricated bracts from beneath which protrude stout brown awns several inches long, the hard sharp-pointed fruit from which the awns spring resembling those of the genus *Stipa*; *Heteropogon melanocarpus*, an annual with stout stems four to six feet high and awned fruits like those of the preceding; *Muhlenbergia elata*, a tall leafy bunch-grass, with long harsh narrow leaves and a large purple rather diffuse panicle over a foot long, with numerous small long-awned spikelets; *Arundinella Palmeri*, a grass resembling the preced-



THE OUTSKIRTS OF ZACATECAS. Much of the country here consists of rolling barren hills. The houses are mostly adobe. The projections near the upper part are pipes for conducting away the water from the flat roofs.

ing in general appearance, but easily distinguished by the broad flat blades and the denser panicle of larger spikelets, each with a bent and twisted awn; *Tripsacum pilosum*, a tall cornlike grass, as much as twelve feet high, with broad blades and hispid sheaths, and a terminal tassel, the spikes of which are pistillate below and staminate above; *Tripsacum lanceolatum*, a smaller species than the preceding, usually not more than four or five feet high; *Andropogon perforatus*, conspicuous with its woolly-white terminal inflorescence of clustered spikes, each spikelet provided on the back with a small pit, like a pin hole; *Paspalum virgatum*, with broad flat blades and a terminal brown or purple inflorescence of numerous spikes, the spikelets circular, flat on one side, convex on the other, nearly sessile along one side of the axis.

Guadalajara was visited by the famous traveler Humboldt and is the type locality of many plants collected by his companion Bonpland.

At Alzada, a station on the railroad a few miles above Colima, at an altitude of about 1,500 feet, a number of interesting and conspicuous grasses were seen. *Tripsacum laxum*, a large tall cornlike plant, six to eight feet high, resembles



PINE FORESTS AT SANCHEZ IN THE SIERRA MADRE, CHIHUAHUA.

Tripsacum pilosum mentioned in the preceding paragraph, but differs in having smooth sheaths. All three of the species of *Tripsacum* were found at Alzada and were usually observed growing upon rocky grassy hillsides. *Pennisetum setosum*, also growing upon cliffs and slopes, has slender culms three to five feet high, terminating in long red spikes, one half inch thick and six to eight inches long. *Lasiacis procerrima* is a tall reedlike grass as much as eight feet high, with numerous broad blades, the base heart-shaped and clasping the stem, the panicle large and spreading.

The eastern slope from the plateau was visited at Cárdenas and at three points in the western part of the state of Veracruz. Much of the region between Cárdenas and Las Canoas on the railroad between San Luis Potosí and Tampico is a rolling prairie, reminding one of the prairies of Iowa. Here were found curly mesquite (*Hilaria cenchroides*) and buffalo grass (*Bulbilis dactyloides*), both common in the plains of Texas, and *Paspalum notatum*, a common species in pasture land at middle and lower altitudes in Mexico and Central America, distinguished by its divergent pair of spikes two or three inches long, with two close rows of sessile spikelets flat on one side and convex on the other. *Bouteloua hirsuta* (black grama) and *B. filiformis*, as well as the widely distributed *B. curtipendula*



MT. ORIZABA NEAR THE TIMBER LINE. An alpine meadow in the foreground; a coniferous forest in the background.

(side-oats grama), were found on these prairies. *Panicum bulbosum*, a perennial species with spreading panicle, is recognized by the thickened bulb or cormlike base which suggested the specific name.

Western Veracruz is particularly interesting because this region was visited by well-known botanists many years ago and a large number of new species were described from their collections. Liebmann, a Danish botanist, made large collections here between 1840 and 1843, especially at Mirador, a hacienda on the east slope of the Mt. Orizaba crest and north-east of the peak. Sartorius, the owner of this hacienda, was also a botanist of note. Schiede and Deppe collected in this region in 1828. Galeotti spent six months at Jalapa, about 1835; Botteri collected around the city of Orizaba in 1850; Müller collected between Veracruz and Orizaba in 1853; Bourgeau, whose collections were probably larger than any of the others mentioned unless it be Liebmann, was sent to Mexico in 1865 by the French Scientific Commission and collected especially at Córdoba and Orizaba.

Jalapa, at an altitude of 4,600 feet, presents a mixture of open prairie and tropical jungle. On the side of a clay cut along the railroad were found several species of *Panicum* belonging to the subgenus *Dichanthelium*. These were of in-



A THATCHED HUT. The common style of dwelling in the country of southern Mexico.

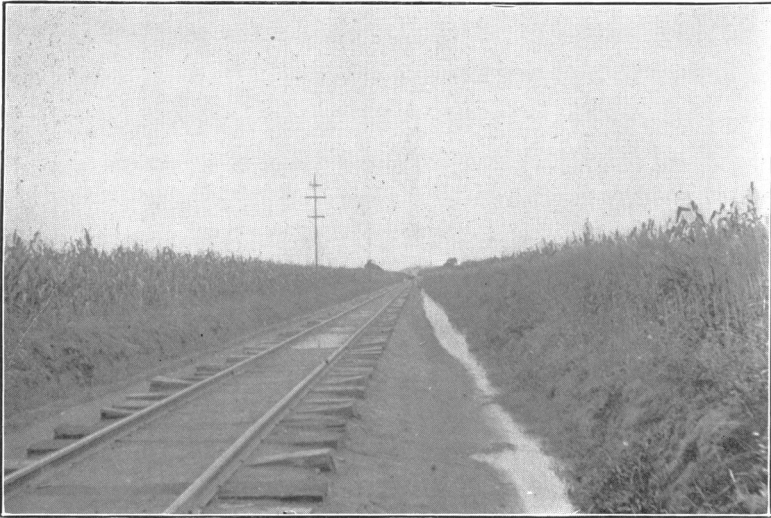
terest botanically because this group of plants is represented by a large number of species in the eastern United States but by few species in Mexico and Central America. Here in this one locality were found six species of this subgenus (*P. xalapense*, *P. viscidellum*, *P. sphærocarpon*, *P. multirameum*, *P. Joorii*, and *P. olivaceum*). *Panicum xalapense* was first collected at Jalapa (or Xalapa as it is sometimes written, the letters j and x representing the same sound in Spanish) but is rare in Mexico, although a common species in southeastern United States. On the prairie were found several tall species of *Andropogon* and allied groups: *Andropogon virginicus* with clusters of delicate woolly spikes scattered along the stem; *A. condensatus*, with short spreading blades and a rather dense inflorescence of numerous spikes; *A. glomeratus*, stiffly upright with a white-topped dense club-shaped inflorescence of delicate woolly spikes; *Elionurus tripsacoides*, with a single terminal spike of rather woolly spikelets; and *Sorphastrum parviflorum* with a close golden-brown panicle of small spikelets. At the edge of the jungle was found *Chætochloa sulcata*, a very ornamental grass with broad plaited blades and a stiff narrow bristly panicle of purple spikelets.

Near Orizaba, just at the western edge of the city, rises a steep rocky hill, much of which is covered with grass. This



WOODED HILLS NEAR COLIMA. A thatched hut with a small patch of corn, surrounded by a fence of interwoven slender poles.

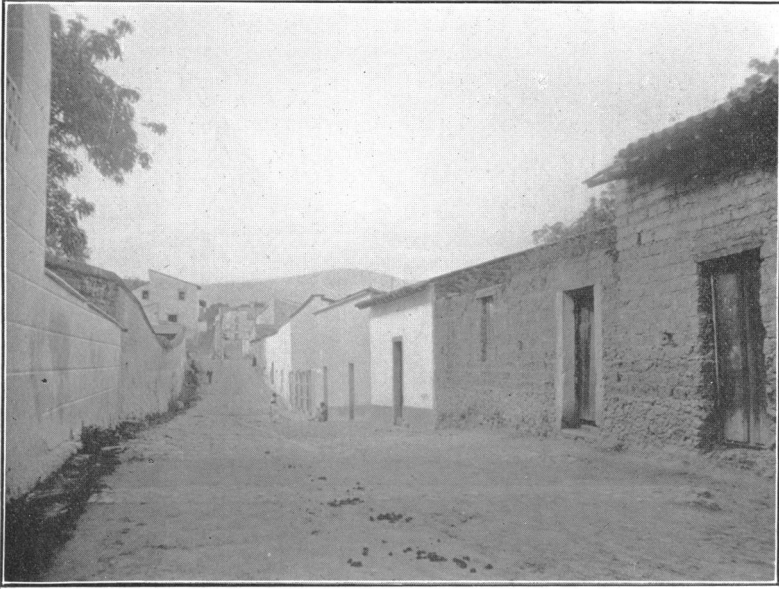
hill, because of its accessibility from the city, has undoubtedly been visited by all the botanists, and there have been many, who have sojourned at Orizaba. This hill is probably the type locality of many species of grasses and the writer is of the opinion that, in some cases at least, he procured specimens from the identical bunch or patch from which specimens had been obtained by these botanists and which became the type specimens of species described by them. *Epicampes Bourgæi*, a coarse rough-leaved bunch-grass with a stiff narrow panicle of pale spikelets was named for Bourgeau, one of these botanists. In the shade of trees at the base of a rocky cliff was found a rare species of *Panicum* (*P. Schmitzii*) described by Dr. E. Hackel from a specimen sent to him as coming from Mexico, but with no data as to locality, collector or date of collection. This grass has broad short flat blades, the shoots being strongly dorsi-ventral, as is the case with many tropical grasses growing in the shade, for example, species of *Oplismenus* and *Ichnanthus*. This rare grass was found again on a shady wet bank at Córdoba, and was collected also by Pringle at Las Canoas, which is also on the slope from the plateau. In the woods at the top of this hill was found a species of woody grass (*Lasiacis sorghoidea*). There are many species of this group in the tropics. They resemble bamboos



A RAILWAY NEAR TOLUCA. On each side are fields of corn, with a fringe of barley. The space between the rails and a little on each side is the highway for peons and burros.

in having woody stems and broad short blades. The flowers, however, show that the group is allied to the great genus *Panicum*, of which it has been considered a section, but from which it is distinguished by the woody culms and the shape and texture of the fruit. One specimen of *L. sorghoidea* was found growing in an open area where it was free to assume a bushy form. The clump of culms, twenty to forty in number, rose to a height of ten or fifteen feet, the upper portion curving gracefully outward. The small branches were borne in whorled clusters at the nodes. When in flower the panicles terminate these branchlets. When growing among shrubs or trees, as is usually the case, the culms clamber upward through the supporting branches for as much as thirty feet. Another interesting member of this group (*L. rhizophora*) was found along the edge of the jungle at Córdoba. In this species the culms do not climb high, but form an intricate tangled mass of branching rooting stems that remain near the ground, the leafy shoots rising to the height of three or four feet.

High Mountains.—Many mountain ranges traverse the plateau. Those toward the western edge are collectively known as the Sierra Madre, and may be considered as a southward extension of the Rocky Mountain system. Several notable volcanic peaks arise as isolated cones, some of them into the region of perpetual snow. The writer ascended three of these



A STREET-SCENE IN THE OUTSKIRTS OF CUERNAVACA.

peaks, Orizaba, Popocatepetl (pronounced Po-pó-ca-tê-pet'-l) and Nevada peak of Colima, the two former rising above snow line, which is at about 15,000 feet in the late summer. The distinctly mountain flora becomes dominant at 10,000 to 11,000 feet. Above timber line (11,000 to 13,000 or even higher in protected places) the grass flora is alpine or at least subalpine. The first peak to be visited by the writer was Popocatepetl. From Popo Park as a base, taking a burro to carry the supplies and light camp outfit, and accompanied by my son as assistant, I ascended as far as the snow line. This trip was particularly interesting because we made our way on foot without a guide or a map, through a region entirely unknown to us. We soon lost the regular trail and meandered upward through the open forest and later on the vast sand and lava stretches above timber line. Upon these alpine plains and ridges the weather was capricious, but mostly foggy or stormy. There were violent squalls with rain, hail or snow, often accompanied by high and variable winds. The trip occupied three days, the two nights being spent at about 11,000 feet.

A conspicuous grass in the lower mountain belt (9,000 to 11,000 feet) is *Festuca amplissima*. This grows in large bunches or tussocks, the leaves numerous, the culms as much as six feet tall, and the lower branches of the large mature panicle reflexed. These bunches, scattered rather thickly



THE HOTEL AT MIÑACA, a junction point on the road from Chihuahua City to Sanchez. Typical of the buildings in northern Mexico, hot and dry on the outside, fairly cool and comfortable within.

through the open woods, give a dominant character to the vegetation. Another bunch-grass (*Cinna poæformis*), somewhat similar in appearance but in smaller light-green bunches about a foot in diameter, is found intermixed with the preceding. There are also, upon the mountain side in this belt, vast areas of open land upon which the dominant and sometimes almost exclusive plant is *Epicampes macroura*, the roots of which are used in the manufacture of scrubbing brushes. The plants grow in large tough tussocks one to three feet in diameter, in rich soil the tussocks touching one another, the leaves numerous, stiff and harsh, the inflorescence a long narrow stiffly upright spike. The bunches of *Epicampes* are evidently sought by cattle, as the ends of nearly all the leaves were eaten off. Growing within the protection of the *Epicampes* was a species of *Bromus* (*B. exaltatus*) with slender stems and a loose panicle resembling oats. In more exposed places this species was often prostrate. At higher altitudes other species became more prominent. A delicate species of *Festuca* (*F. willdenoviana*), one to two feet high, with soft short leaves and a nodding few-flowered panicle, was common in the upper wooded belt. Here were also *Poa annua*, the common weedy



A PRIMITIVE CONTRIVANCE FOR RAISING WATER FOR IRRIGATION. The horse turns a large horizontal wheel. The vertical pegs on the under side engage a similar series on the side of the vertical wheel, which in turning raises a line of buckets on the circumference. The supporting pillars are of adobe. Near Zacatecas.

Poa of our eastern states; *Poa conglomerata*, a usually prostrate plant with a narrow dense panicle, and *Graphephorum altijugum*, with delicate erect culms and a narrow panicle. Just above timber line in the bunch-grass belt were found *Festuca tolucensis* and *Calamagrostis tolucensis*, originally collected in similar situations on Mt. Toluca, a volcano near the city of Toluca. They both have numerous narrow erect leaves. The latter species extends to snow line and in favorable situations forms a sort of fairy-rings, due to the indefinite expansion of the tussock and the death and decay of the interior, leaving a narrow annular zone of the living grass. These rings may be many feet in diameter, but finally break up into segments and the original ring becomes indefinite or obsolete. Other grasses of this alpine region are *Agrostis Schiedeana*, *Trisetum spicatum*, common in the high mountains in the United States and extending to the Arctic regions, and *Festuca livida*, a low grass growing in the volcanic sand below snow line, conspicuous because of the comparatively large deep-purple spikelets.

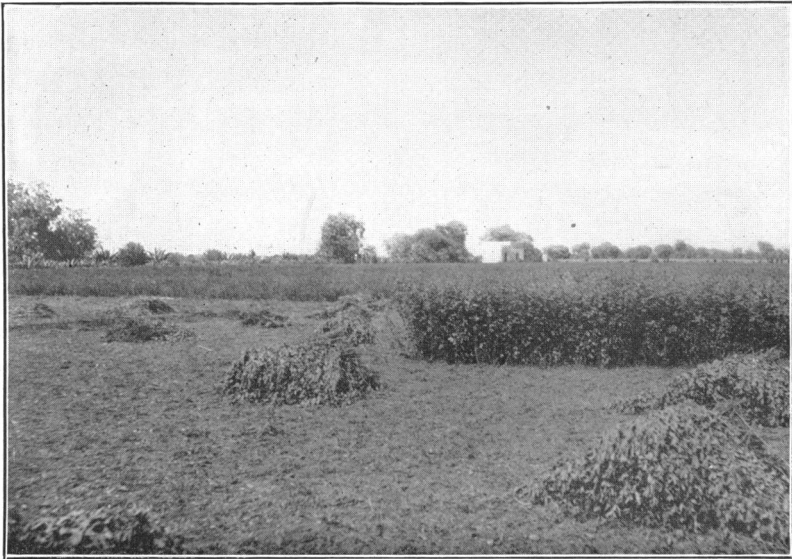
Mt. Orizaba was ascended from Chalchicomula, on horseback with servants (mozos) and guides. Two days were taken



A LARGE ALFALFA FIELD NEAR TOLUCA. In this field of over one hundred acres the alfalfa was grown in rows and cultivated.

for the trip, the night being spent in a cave about timber line. The writer ascended the peak over the snow nearly to the top, but was prevented from reaching the actual summit by the violent gale blowing from the east. Many of the species mentioned above as occurring on Popocatepetl were also found on Orizaba (such as *Bromus exaltatus*, *Poa conglomerata*, *Trisetum spicatum*, *Festuca amplissima*, *F. livida*, *F. tolucensis*, *Epicampes macroura*). Another *Festuca* (*F. hephæstophila*) and a species of *Calamagrostis* were collected. The *Festuca* grows in small tufts, looking like our sheep's fescue. This and *Calamagrostis Schiedeana* grew together in the grassy meadows above timber line, the latter in large bunches like *Calamagrostis tolucensis*. Both have numerous firm involute root leaves, with a papery tawny base peculiar to alpine grasses.

Mt. Nevada was reached on horseback from Zapotlán over a good trail. Two days were taken for this trip, the night being passed in a cabin at about 11,000 feet. The dominant grasses in the upper regions of the timber and extending well above timber line are *Calamagrostis tolucensis* and *Festuca tolucensis*, both found on Orizaba. This is interesting as showing the similarity of the flora of the mountain tops as compared with the diversity in the flora of the lower regions. *Trisetum spicatum* was found throughout the region above timber up to the very summit.



A FIELD OF ALFALFA NEAR SAN LUIS POTOSÍ. The plants are cut by hand, piled in heaps, and then tied in bundles for transport.

The grasses of the northern Sierra Madre were studied at Sanchez, then the terminus of the railroad from Chihuahua to Topolobampo. This is on the continental divide at an altitude of about 8,000 feet, in the midst of pine forest. The species of grasses found here are in the main different from those found in the other regions mentioned, and the flora shows a close affinity with that of southern Arizona. The dominant grasses are species of *Muhlenbergia*, *Sporobolus* and *Epicampes*. Certain annual species were especially abundant, such as *Sporobolus ramulosus*, *S. confusus*, *S. Shepherdii* and *Muhlenbergia peruviana*.

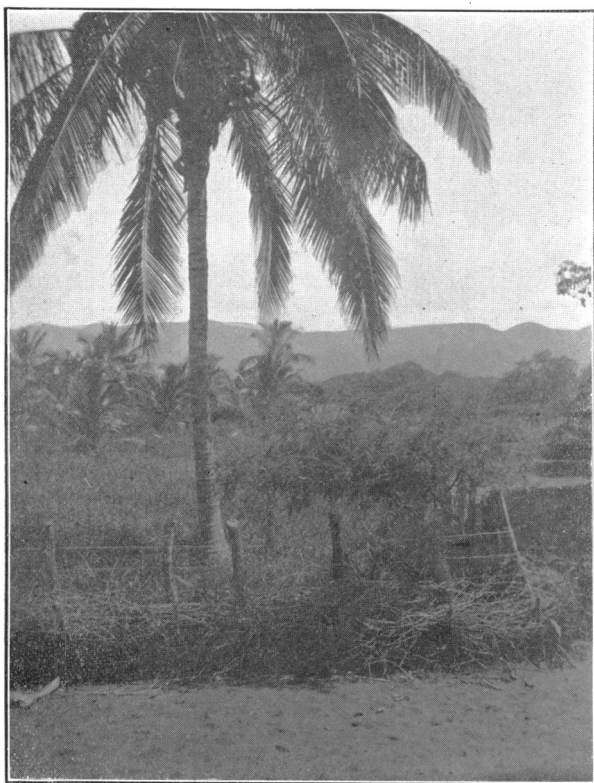
Grasses of Ponds and Marshes.—The grasses of ponds, marshes, river banks and similar situations occupied by water plants are much the same throughout Mexico. The flora of fresh-water ponds is well illustrated by the grasses seen at Orozco, a station twelve miles south of Guadalajara. Certain species were found only in the water, such as: *Panicum paludivagum*, with a long narrow inflorescence of several short appressed spikes, and very long submerged rooting stems; *Panicum sucosum*, with spreading panicle and long submerged stems as in the preceding; *Paspalum longicuspe*, growing in deep water among water-lilies, only the inflorescence emerged, this consisting of numerous flat spreading spikes, the indefinitely long rooting stems submerged, but floating by means of



A FIELD OF PARÁ GRASS NEAR URUÁPAN. This is a common forage grass at low altitudes in Mexico. Mostly cut and fed green. A native of Brazil.

the large masses of roots at the nodes; *Echinochloa holciformis*, a tall erect broad-leaved grass, rising well above the water and bearing a close panicle of large long-awned spikelets; *Homalocenchrus hexandrus*, a small, rather delicate, but wiry grass, with a small panicle of very flat spikelets. Along the edge of the pond, growing in mud or in shallow water, were found *Distichlis spicata* (salt grass), *Paspalum vaginatum*, with a pair of spikes at the summit of the slender culm, *Echinochloa zelayensis*, allied to our barn-yard grass, and *Lep-tochloa fascicularis*, with several stiffly ascending spikes.

Distichlis spicata, mentioned above, is a common grass in moist alkaline soil and along the banks of ditches. Another common plant in such situations is *Paspalum distichum*, which resembles *P. vaginatum* in having two divergent spikes at the summit. Along the margins of ditches and streams where the soil is not especially alkaline one finds *Polypogon elongatus*, with slender lax stems and a narrow panicle of small flowers turning yellow with age; *Panicum laxum* and *P. pilosum*, small plants with several spikes of small round spikelets, and many species of *Paspalum* characterized by their plano-convex spikelets. *Arundo Donax* is a large reed with broad leaves, stems as much as twenty or thirty feet high, and large feathery



A COCONUT PALM AT URUÁPAN. It is rather unusual to find coconuts growing so far from the coast.

plumes when in flower. This reed, introduced from Europe, often grows in dense masses along the banks of irrigation ditches.

Weedy Grasses.—Many of the weedy grasses of cultivated soil and waste places are introduced from the Old World. Others are natives of Mexico or Central America. The following are the more common and widespread species.

The annuals will be mentioned first, as they are the common weeds of cultivated fields: *Syntherisma sanguinalis* (crab-grass), with spreading stems, hirsute sheaths and slender digitate spikes, common everywhere; *Eragrostis mexicana*, with a diffuse panicle of lead-colored spikelets, very common in cultivated soil, throughout Mexico; *Eragrostis caroliniana*, similar to the preceding but with smaller spikelets, less common; *Eragrostis ciliaris*, with a narrow panicle of strongly ciliate spikelets, a weed of streets in the coastal plain; *Panicum fasciculatum*, with panicles of round reticulate yellow or dark-brown

spikelets, the main branches spikelike, common in fields at lower altitudes; *Panicum hirticaule*, with a diffuse panicle, resembling our old witch grass, common at low and medium altitudes on the Pacific slope; *Brachiaria plantaginea*, with a few spreading spikes of roundish spikelets growing in moist cultivated soil; *Leptochloa filiformis*, with many slender spreading purple spikes of small spikelets, common in rich fields in the coastal plain; *Cenchrus carolinianus* and *C. echinatus* (sand-bur), the former with a looser spike of burs, common in fields and waste places; *Eleusine indica* (goose grass), a smooth grass with a few digitate spikes, found chiefly along streets and in waste places. There are, of course, many other weedy annual grasses, but the above are the commoner kinds.

The perennials are fewer in the number of the species and are found chiefly in pastures and waste places. *Chætochloa geniculatus* (fox-tail) resembles our northern species, differing in being perennial, one of the few of this class common in cultivated soil. *Holcus halepensis* (Johnson grass) has obtained a foothold here and there, and may prove a serious pest, as is now the case in Texas and other of our Southern States. *Sporobolus Berteroanus* (smut grass) can be recognized by its long slender panicle of small flowers that are frequently blackened by a fungus. Certain species of *Paspalum* are common in meadows, pastures and along roads (*P. convexum*, *P. plicatulum*, *P. squamulatum*). *Paspalum conjugatum*, with stolons and a pair of long slender spikes, is very common in tropical America and extends into the lowlands of Mexico.

The grasses obtained on this trip yielded one new genus and twelve new species, and in the study of the collection ten more new species were found among the grasses secured by others.